

What is claimed is:

1. A method for searching an algebraic codebook in algebraic code excited linear prediction (ACELP) vocoding  
5 using a depth first tree method, the method comprising the steps of:

a) searching nodes of a tree at predetermined levels in order to predict a branch in which optimum pulse is located;

b) choosing a predetermined number of branches according  
10 to the search result of the step a) and removing residual branches; and

c) searching the chosen branches and choosing optimum algebraic code.

15 2. The method as recited in claim 1, wherein step a) includes the steps of:

a1) determining a level 'L' at which branches are searched;

a2) finding maximum values of each track;

20 a3) fixing a maximum value in total tracks as a first pulse;

a4) fixing a maximum value in a next track below the track at which the first pulse is found as a second pulse;

a5) searching a third pulse and a fourth pulse at next two  
25 tracks below the track at which the second pulse is found; and

a6) fixing other maximum value except the first pulse as the second pulse and executing the step a5).

3. The method as recited in claim 1, wherein T number of branches is chosen based on an equation as:

$$T_k = \frac{(C_k)^2}{E_k} = \frac{(Hxc_k)^2}{c_k' H' H c_k} = \frac{(d' c_k)^2}{c_k' \Phi c_k} ,$$

wherein  $E_k$  represents energy of synthesized signal,  $C_k$  means correlation between target signal and synthesized signal,  $x$  is a target signal from which a predicted gain of an adaptive codebook is removed,  $H$  is a lower triangular toeplitz convolution matrix,  $H^t$  is a transposed matrix of  $H$ ,  $c_x$  is an algebraic code vector,  $c_x^t$  is a transposed matrix of  $c_x$ ,  $d$  is a reverse filtered target signal,  $d^t$  is a transposed matrix of  $d$ ,  $\Phi$  is a correlation matrix of  $h(n)$ , which is impulse response.

4. The method as recited in claim 1, wherein in case of searching locations of two pulses in each track that has locations of 8 pulses in the algebraic codebook that has 5 tracks, the number of searching at a predetermined level 'L' is  $4 \times L \times (8 \times 8)$  times.

5. The method as recited in claim 4, wherein the number of searching a predetermined number of chosen branches 'T' is  $T \times (4-L) \times (8 \times 8)$  times.

6. The method as recited in claim 1, wherein in case of searching locations of two pulses in each track that has

locations of 8 pulses in the algebraic codebook that has 5 tracks, a total number of searching is  $4 \times L \times (8 \times 8) + T \times (4 - L) \times (8 \times 8)$  times.